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RADIOMETRY ENGINEER

SPE ATOMTEX,  
BELARUS

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# SPE ATOMTEX

## Instruments & technologies for nuclear measurements & radiation monitoring



Dosimeter  
AT1123



Backpack spectrometer  
AT6101C



Handheld spectrometer  
AT6102

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# Sphere of interest

- Spectrometry
  - Spectrums processing (modeling)
  - Taking part in the developments of a new devices
  - Conferences and exhibitions
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# HAND-HELD SPECTROMETERS



AT6102



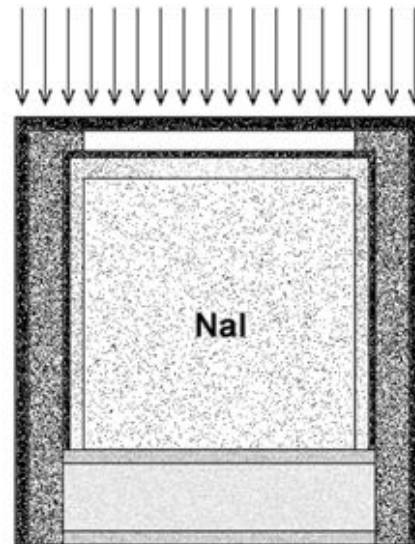
AT6101



SPRD

AT1321

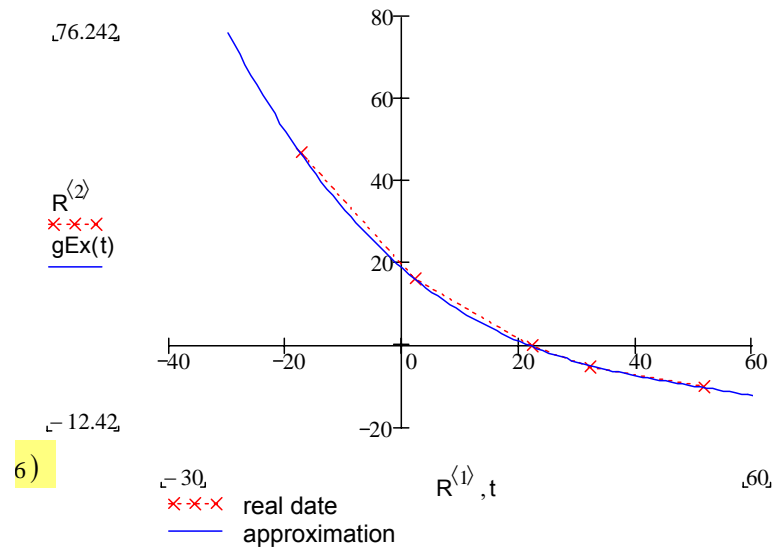
Spectrometers based on NaI(Tl) scintillations crystals with various size (mm) 40x40, 63x63, 25x40, 40x80, 63x160



# Calibration

## 1. Temperature calibration

	channel	T,C	meas%	calc%	new		
R=	0	1	2	3	4	5	
	0	149.90	-17.60	46.90	46.87	149.93	0.02
	1	189.90	2.10	15.96	16.10	189.67	-0.12
	2	220.20	22.00	0.00	-0.35	220.97	0.35
	3	232.30	32.00	-5.21	-4.93	231.62	-0.29
	4	245.60	51.60	-10.34	-10.38	245.71	0.05
	5						
	6						



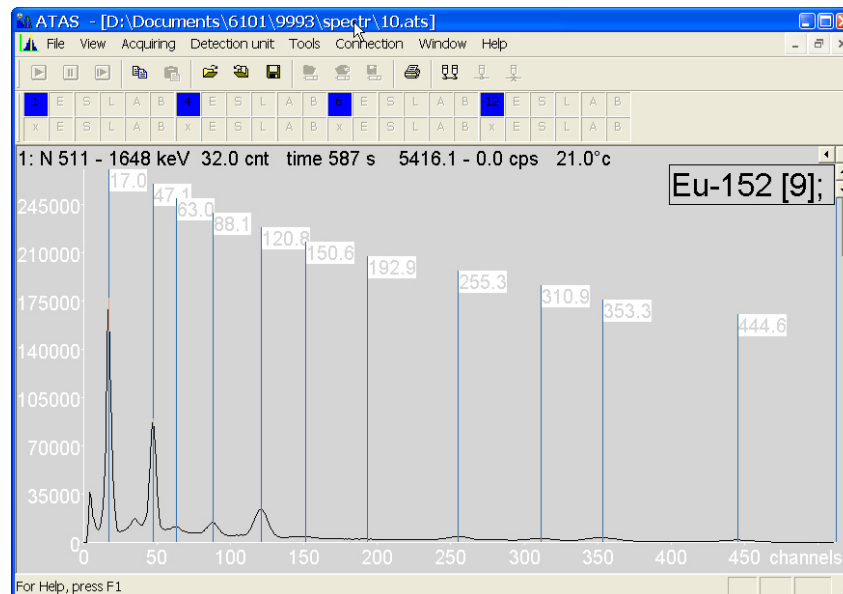
Cubic splain coefficients

$$Cex^T = (-0.000126173299 \quad 0.019397112256 \quad -1.226379348155 \quad 18.586962804466)$$

## 2. Channel - Energy

Radionuclide Sources  
OSGI – 3

Software “ATAS”



## Nucleonica Applications

**Cs137**  
30.06 y

**Decay engine**  
**55 Cesium**

Current Chart: Karlsruhe

Element: Cs Mass: 137 Mixture selector

Decay Engine Options

Quantity: Becquerel 10600 Accuracy Factor: 1E-02 Distance (cm):  
Time: Days 163 Number of timesteps: 10 Number of chains:

Start Start in background Reset Show details Create Nuclide Mixture

Parent-Daughters	Half-life	BR	N(Atoms)	M(g)	A(Bq)
55 Cs137	30.06 y	0.943995; 5.60E-02	1.43E+13	3.26E-09	1.05E+04
56 Ba137 Stable	stable		1.49E+11	3.38E-11	0
56 Ba137 m	2.55 m	1	2.19E+06	4.97E-16	9.90E+03
Total:			1.45E+13	3.30E-09	20400

**Cs137**  
30.06 y

**Mass Activity Calculator**  
**55 Cesium**

Current Chart: Karlsruhe

Element: Cs Mass: 137 Mixture selector

Quantity: 10600 Unit: Activity (Bq) Convert

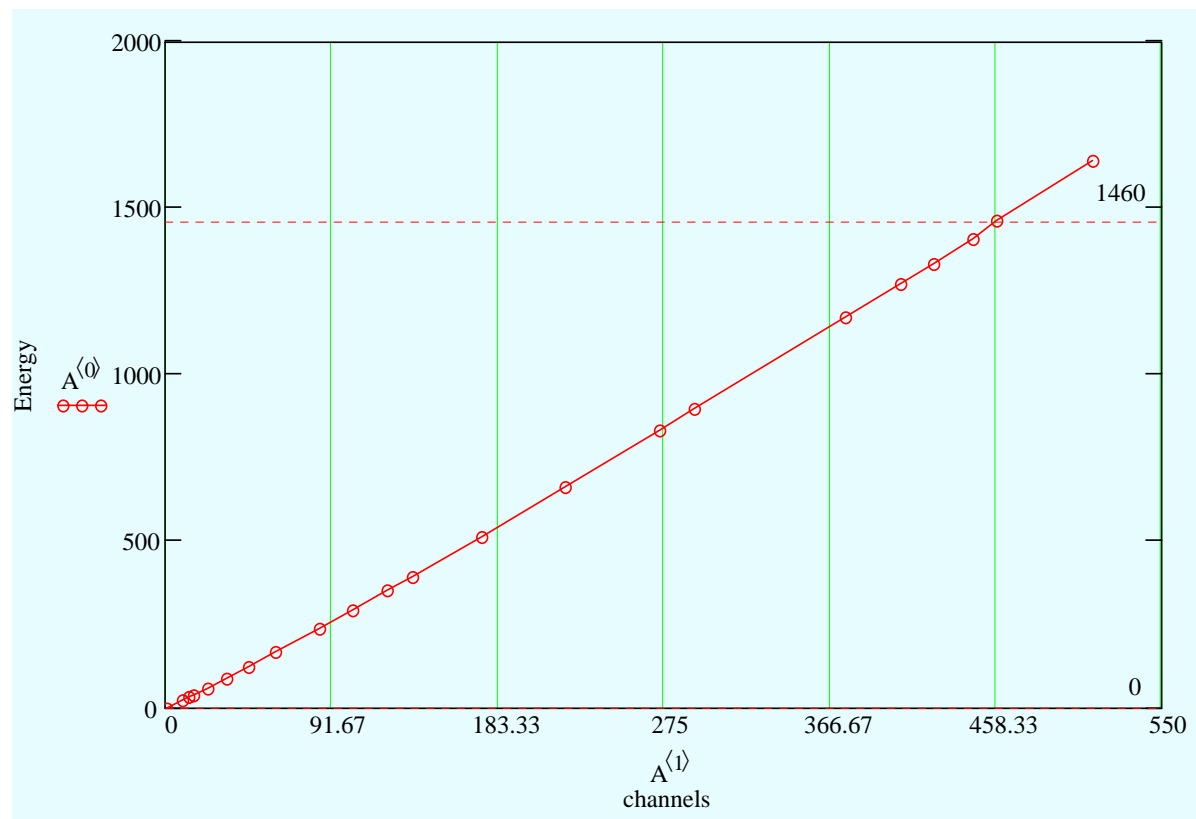
Convert to:	Quantity
Mass (g)	3.296e-9
Activity (Bq)	1.060e+4
Activity (Ci)	2.865e-7
Number of atoms	1.450e+13
Mole of atoms	2.407e-11
Gamma dose rate (μSv/h)	2.502e-9
Committed Effective Dose Equivalent, e(50)inhalation (μSv)	413.4
Committed Effective Dose Equivalent, e(50)ingestion (μSv)	137.8
Isotopic Power α (Watt)	0
Isotopic Power α+β (Watt)	3.186e-10
Isotopic Power α+β+γ (Watt)	3.186e-10

at 100

## Calibration file – “energy.txt”

A =

	0	1	2
0	0	0	0.1
1	22	8.7	0.1
2	32	12.6	0.1
3	40	15.5	0.1
4	59.5	23.1	0.1
5	88	33.3	0.1
6	122	45.2	0.1
7	165.9	60	0.1
8	239	84.5	0.1
9	295	103.1	0.1
10	352	122	0.1
11	391.7	135.6	0.1
12	511	173.9	0.1
13	661.7	220	0.1
14	834.8	272.6	0.1
15	898	291.7	0.1
16	1173.2	374.7	0.1
17	1274.6	405.6	0.1
18	1332.5	423.4	0.1
19	1408	445.5	0.1
20	1461	458.2	0.1
21	1644.5	511	0.1
22			
23			



# Modeling spectrums

- “Mathcad”

- modeling spectrums of nuclide mixtures (Na-22 + Co-60 + Zn-65) and calculate their activity – stationary spectrometer AT1315

- Monte-Carlo “SNEGMONT”

For example

Math software using for modeling spectrums of medicine nuclides

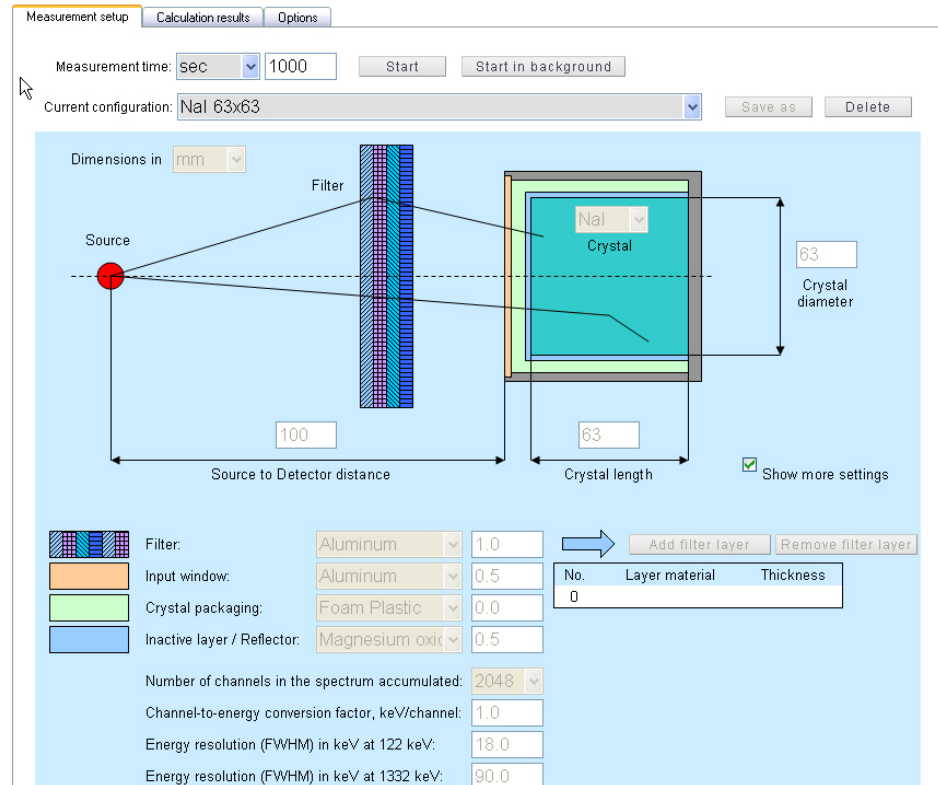
I-125, Tl-201, Tc-99m, I-123, In-111 и I-131

And then calculate the activity in sample

- Gamma radioactivity monitor AT1320M

- Analysis spectrums for improving methods of identifications radionuclides

- Use Nucleonica - GSG will be very usefully for these purposes

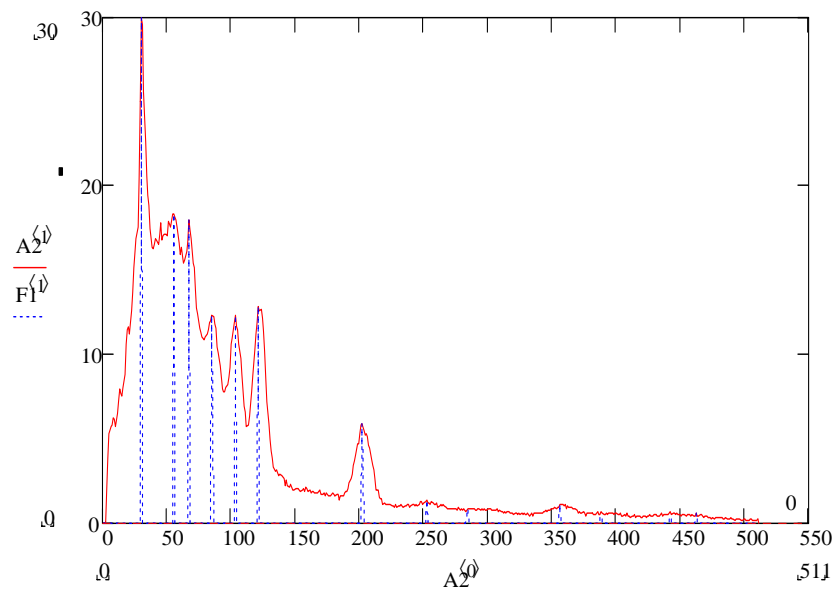




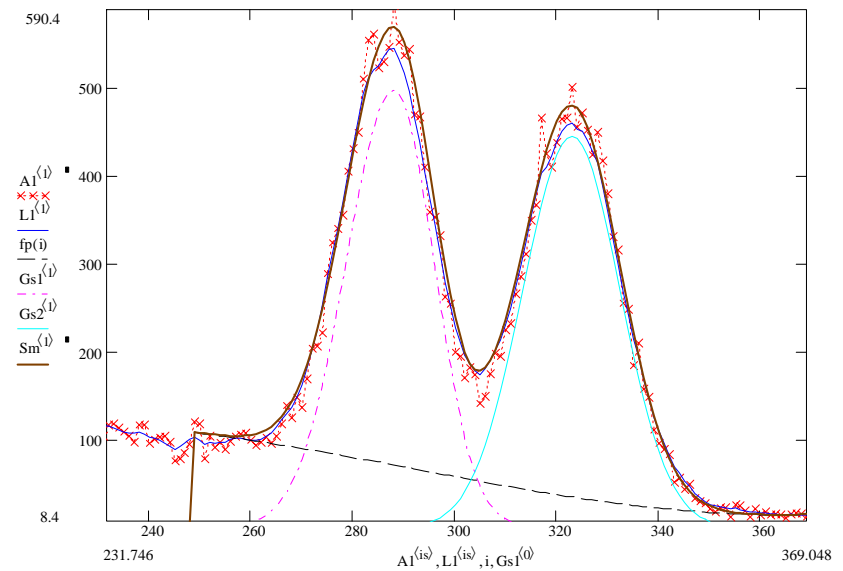
# Analysing spectrums in “mathcad”

- The peaks search, processing of a multiplets
- Estimating background
- Calculating FWHM
- Identification

Ra-226



Co-60

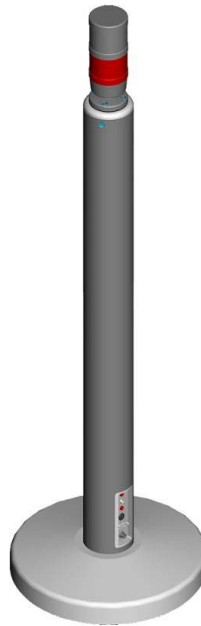


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# Development



NSD



SPRM



SPRD

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# Thanks for attention

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